PATENT ABSTRACTS OF JAPAN

(11)Publication number : **09-107330**

(43)Date of publication of application : **22.04.1997**

(51)Int.Cl. H04B 10/105
H04B 10/10
H04B 10/22
H04B 10/24

(21)Application number : **07-265306**

(22)Date of filing : **13.10.1995**

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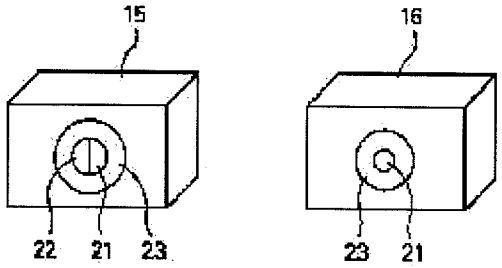
(54) OPTICAL TRANSMITTER-RECEIVER, OPTICAL AXIS ALIGNMENT METHOD THEREFOR AND OPTICAL RADIO SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an optical axis alignment method for an optical transmitter-receiver in which optical axis alignment for communication light with directivity sent by optical transmitter-receiver sets is easily attained.

SOLUTION: A master set 15 is provided with a communication use light emitting section 21 for usual optical communication and a search use light emitting section 22 to provide an output of a light with a wide directive angle for optical axis adjustment. In order to start the optical alignment of a slave set 16, the search use light emitting section 22 of a master set 15 is lighted to conduct optical axis alignment of the slave set 16 by using the light with the wide directive angle. Then idle lights sent from communication use light emitting sections 21 of the master set 15 and the slave set 16 are used to adjust the optical axis.



LEGAL STATUS

[Date of request for examination] 14.10.1999

[Date of sending the examiner's decision of

rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3230961
[Date of registration]	14.09.2001
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The optical-axis adjustment approach of the optical transceiver machine characterized by what an angle of beam spread makes a large search guide light emit light rather than said communication link light from one optical transceiver machine, and the optical transceiver machine of another side performs the first optical-axis adjustment for for the purpose of this search guide light in the optical-axis adjustment approach of an optical transceiver machine of performing optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels.
[Claim 2] One [said] optical transceiver machine is the optical-axis adjustment approach of the optical transceiver machine according to claim 1 characterized by what light is emitted in said search guide light, and the optical transceiver machine of another side performs [a thing] adjustment for the first optical axis for the purpose of this search guide light when communication link light from the optical transceiver machine of said another side cannot be received.
[Claim 3] The optical-axis adjustment approach of the optical transceiver machine according to claim 1 or 2 characterized by what an angle of beam spread makes a large search guide light emit light rather than said communication link light from the optical transceiver machine of another side, and one optical transceiver machine performs optical-axis adjustment for for the purpose of this search guide light.
[Claim 4] The optical-axis adjustment approach of the optical transceiver machine according to claim 3 characterized by what each optical-axis adjustment of the both light transceiver machine aiming at said search guide light is repeated for two or more times.
[Claim 5] Claim 1 characterized by what the optical axis of a both light transceiver machine is inharmonious, and makes the angle of beam spread of said search guide light larger than usual at the time of un-communicating [of a both light transceiver machine], and emits light for thru/or the optical-axis adjustment approach of the optical transceiver machine any one publication of four.
[Claim 6] In the optical-axis adjustment approach of an optical transceiver machine of performing optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels The light of a specific pulse pattern with a larger angle of beam spread than said communication link light is made to emit light from one optical transceiver machine. Because the optical transceiver machine of another side starts optical-axis adjustment, makes light emit light from the optical transceiver machine of another side and receives the light from the optical transceiver machine of another side with one optical transceiver vessel by receiving this light The optical-axis adjustment approach of the optical transceiver machine characterized by what optical-axis adjustment between both light transceiver machines is performed, and optical-axis adjustment transmits the light of a different wave-like pulse pattern from the light of said specific pulse pattern to the other party, and ends optical-axis adjustment for in the phase which reached predetermined level.
[Claim 7] In the optical-axis adjustment approach of an optical transceiver machine of covering multiple times and performing optical-axis doubling of the communication link light by which intensity modulation was carried out with optical transceiver vessels on the predetermined frequency which has the directivity which each emits While an angle of beam spread adjusts the optical axis of the

communication link light between optical transceiver machines for the purpose of a large search guide light rather than said communication link light which an optical transceiver machine emits The optical-axis adjustment approach of the optical transceiver machine characterized by replacing the frequency of said communication link luminous-intensity modulation by the transmitting side and the receiving side whenever it performs each optical-axis doubling.

[Claim 8] The light-emitting part for a communication link which emits the communication link light which has a predetermined angle of beam spread, and the light-emitting part for a search which emits search guide light with a larger angle of beam spread than said communication link light in an optical transceiver vessel, Said light-emitting part for a search is made to emit light at a light-receiving means to receive an extraneous light, and the time of optical-axis adjustment. The optical transceiver machine characterized by having the control means which controls the orientation of said light-emitting part for a communication link, the light-emitting part for a search, and a light sensing portion in one to make said light-emitting part for a communication link emit light at the time of a communication link, and for the light-receiving quantity of light of said light-receiving means to benefit optical-axis adjustment of self the largest.

[Claim 9] Said light-emitting part for a communication link and said light-emitting part for a search are an optical transceiver machine according to claim 8 characterized by what consists of optical means for adjusting the angle of beam spread of the light from the light source and said light source.

[Claim 10] Said control means is an optical transceiver machine according to claim 8 characterized by what consists of optical means for adjusting the angle of beam spread of the light from the light source and said light source when said light-emitting part for a search is made to emit light to said light-emitting part for a search for optical-axis doubling by the side of a communications partner and said light sensing portion receives a predetermined signal.

[Claim 11] In the optical wireless system which performs optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels, and performs mutual optical radio The light-emitting part for a search which emits search guide light with a larger angle of beam spread than said communication link light in an optical transceiver vessel, The optical wireless system characterized by adjusting the optical axis of the communication link light between optical transceiver machines by receiving the search guide light which prepares the light sensing portion for a search which receives the light from the other party, and the other party's light-emitting part for a search emits by the light sensing portion for a search.

[Claim 12] The optical wireless system carry out adjusting the optical axis of the communication link light between optical transceiver machines for the purpose of the search guide light which forms the light-emitting part for a search with which an angle of beam spread emits a large search guide light rather than said communication link light in an optical transceiver vessel in the optical wireless system which performs optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels, and performs mutual optical radio, and this light-emitting part for a search emits as the description.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical-axis adjustment approach and the optical wireless system of an optical transceiver machine with easy optical-axis adjustment, and an optical transceiver machine.
[0002]
[Description of the Prior Art] An optical transceiver machine with directivity is made to counter 1 to 1, and the optical wireless system which performs optical communication among both is used widely. In an optical wireless system, as shown in drawing 14 , when the communication direction (henceforth an optical axis) of two optical transceiver machines 50A and 50B is in agreement, it can communicate, but a communication link becomes impossible when the optical axis of the optical axis of the optical transceiver machines 50A and 50B and the optical transceiver machine 50 of another side is an inequality, as shown in drawing 15 .
[0003] For this reason, in an optical radio communications system, as shown in drawing 14 , it is necessary to turn and adjust the optical axis of each optical transceiver machine 50 to a mutual communication direction.
[0004] Generally adjustment of the optical axis of an optical radio communications system is performed by the following procedures. First, transmitting a lightwave signal from one optical transceiver machine 50A, the optical axis is changed and temporary immobilization of one optical transceiver machine 50A is carried out in the condition that the receiving sensibility of optical transceiver machine 50B of another side becomes the highest. Next, the optical axis is changed transmitting a lightwave signal from optical transceiver machine 50B of another side, and temporary immobilization of the optical transceiver machine 50B of another side is carried out in the condition that the receiving sensibility of one optical transceiver machine 50A becomes the highest. Thus, after making the optical axis of the optical transceiver machines 50A and 50B agree, the both light transceiver machines 50A and 50B are fixed strongly.
[0005] Generally, adjustment of the optical axis of the optical transceiver machine 50 with directivity will become more delicate, as directivity becomes strong, and the time amount which adjustment takes will also increase in hand regulation. especially -- an angle of beam spread theta -- abundance -- when the following directivity is the powerful optical transceiver machines 50, the optical-axis adjustment by hand control is very difficult.
[0006] In order to solve this problem, the technique which carries out regulating automatically of the optical-axis adjustment is proposed by Japanese Patent Application No. No. 304638 [four to], Japanese Patent Application No. No. 277854 [five to], etc. It also enabled those who the installation time amount of the optical transceiver machine 50 is shortened by this invention, and do not have optical-axis adjustment technique to install the optical transceiver machine 50.
[0007]
[Problem(s) to be Solved by the Invention] However, even if the optical-axis adjustment itself is

automated, it is necessary to perform the signal of initiation of optical-axis adjustment manually. Moreover, a total of every two 1-time adjustments [optical-axis] is required in one optical transceiver machine and the optical transceiver machine of another side at least respectively irrespective of whether optical-axis adjustment is performed automatically.

[0008] For this reason, the technical problem described below occurs. In addition, in the following explanation, in order to make an understanding easy, among the optical transceiver machines 50 of a pair, one side is set to main phone 50A, another side is set to cordless handset 50B, and the actuation which sets an optical axis in search of the direction of the whereabouts of a communications partner is called a search.

[0009] (1) The first search is difficult.

the first search -- a cordless handset -- the time of turning the optical axis of 50B to main phone 50A -- the inside of the angle of beam spread theta of main phone 50A -- a cordless handset -- when 50B exists, it is shown in drawing 14 -- as -- a cordless handset -- 50B is ability ready for receiving about the light from main phone 50A. however, it is shown in drawing 15 -- as -- the outside of the angle of beam spread theta of main phone 50A -- a cordless handset -- the case where 50B is located -- a cordless handset -- 50B cannot look for the direction of main phone 50A.

[0010] thus, the optical axis of main phone 50A -- a cordless handset -- it will be the requisite for optical-axis adjustment to suit in the direction of 50B to some extent. however, the angle of beam spread theta of main phone 50A -- since it is small -- the optical axis of main phone 50A -- a cordless handset -- it is difficult to double with 50B itself. main phone 50A and a cordless handset -- once the optical axis of 50B is in agreement, the optical axis shifts in a certain reason, and also when adjusting an optical axis again, the same problem arises.

[0011] (2) A limitation is in the precision of optical-axis adjustment.

main phone 50A and a cordless handset -- the case where the search of 50B is by a unit of 1 time, respectively -- a cordless handset -- in agreement with the optical axis of main phone 50A, in the optical axis of 50B -- making -- then, the optical axis of main phone 50A -- a cordless handset -- the optical axis of 50B is made in agreement for this reason, a cordless handset -- after adjusting the optical axis of 50B, the optical axis of main phone 50A is moved -- ******** -- strict -- a cordless handset -- the optical axis of 50B and main phone 50A will not be in agreement.

[0012] (3) If the count of a search is increased again in order to improve adjustment precision since [which is not automated as the whole search actuation of multiple times] it does not automate as the whole optical-axis adjustment processing, the time and effort of adjustment will increase.

[0013] This invention was made in view of the above-mentioned actual condition, and aims at offering the optical transceiver machine which can automate optical-axis adjustment, the optical-axis adjustment approach, and an optical wireless system. Moreover, this invention sets it as other purposes to offer the optical transceiver machine and the optical-axis adjustment approach of adjusting an optical axis easily and correctly, and an optical wireless system.

[0014]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the optical-axis adjustment approach of the optical transceiver machine concerning the 1st viewpoint of this invention In the optical-axis adjustment approach of an optical transceiver machine of performing optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels An angle of beam spread makes a large search guide light emit light rather than said communication link light from one optical transceiver machine, and it is characterized by the optical transceiver machine of another side performing the first optical-axis adjustment for the purpose of this search guide light.

[0015] Moreover, the optical-axis adjustment approach of the optical transceiver machine concerning the 2nd viewpoint of this invention In the optical-axis adjustment approach of an optical transceiver machine of performing optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels The light of a specific pulse pattern with a larger angle of beam spread than said communication link light is made to emit light from one optical transceiver

machine. Because the optical transceiver machine of another side starts optical-axis adjustment, makes light emit light from the optical transceiver machine of another side and receives the light from the optical transceiver machine of another side with one optical transceiver vessel by receiving this light It is characterized by what optical-axis adjustment between both light transceiver machines is performed, and optical-axis adjustment transmits the light of a different wave-like pulse pattern from the light of said specific pulse pattern to the other party, and ends optical-axis adjustment for in the phase which reached predetermined level.

[0016] Moreover, the optical-axis adjustment approach of the optical transceiver machine concerning the 3rd viewpoint of this invention In the optical-axis adjustment approach of an optical transceiver machine of covering multiple times and performing optical-axis doubling of the communication link light by which intensity modulation was carried out with optical transceiver vessels on the predetermined frequency which has the directivity which each emits While an angle of beam spread adjusts the optical axis of the communication link light between optical transceiver machines for the purpose of a large search guide light rather than said communication link light which an optical transceiver machine emits, it is characterized by replacing the frequency of said communication link luminous-intensity modulation by the transmitting side and the receiving side, whenever it performs each optical-axis doubling.

[0017] Moreover, the optical transceiver machine concerning the 4th viewpoint of this invention The light-emitting part for a communication link which emits the communication link light which has a predetermined angle of beam spread, and the light-emitting part for a search which emits search guide light with a larger angle of beam spread than said communication link light in an optical transceiver vessel, Said light-emitting part for a search is made to emit light at a light-receiving means to receive an extraneous light, and the time of optical-axis adjustment. Said light-emitting part for a communication link is made to emit light at the time of a communication link, and it is characterized by having the control means which controls the orientation of said light-emitting part for a communication link, the light-emitting part for a search, and a light sensing portion in one for the light-receiving quantity of light of said light-receiving means to benefit optical-axis adjustment of self the largest.

[0018] Moreover, the optical transceiver machine concerning the 5th viewpoint of this invention In the optical wireless system which performs optical-axis doubling of the communication link light which has the directivity which each emits with optical transceiver vessels, and performs mutual optical radio The light-emitting part for a search which emits search guide light with a larger angle of beam spread than said communication link light in an optical transceiver vessel, The light sensing portion for a search which receives the light from the other party is prepared, and it is characterized by adjusting the optical axis of the communication link light between optical transceiver machines by receiving the search guide light which the other party's light-emitting part for a search emits by the light sensing portion for a search.

[0019]

[Embodiment of the Invention] Hereafter, the optical transceiver machine concerning the gestalt of operation of this invention, the optical-axis adjustment approach, and an optical wireless system are explained to a detail.

[0020] (Gestalt of the 1st operation) Drawing 1 shows the example of the optical wireless structure of a system concerning the gestalt of implementation of this invention. Two or more LAN connection devices 13 which this communication system was connected to the cable 11 and the cable 11, and were equipped with communication facility, A cable 12 and two or more LAN connection devices 14 which were connected to the cable 12 and equipped with communication facility, It consists of the 1st optical transceiver machine 15 connected to the cable 11, and the 2nd optical transceiver machine 16 connected to the cable 12, and has the configuration which permuted a part of cable LAN by the optical wireless LAN which consists of the 1st optical transceiver machine 15 and the 2nd optical transceiver machine 16.

[0021] The 1st optical transceiver machine 15 is equipped with the light-emitting part 21 for a communication link which outputs the lightwave signal for the optical communication of an angle of

beam spread theta 0, the light-emitting part 22 for a search which emits light in the search GAITO light SG for optical-axis adjustment which has the larger angle of beam spread theta 1 than an angle of beam spread theta 0, and a light sensing portion 23 as shown in drawing 2 (A). The 2nd optical transceiver machine 16 is equipped with the light-emitting part 21 for a communication link which outputs the lightwave signal for the optical communication of an angle of beam spread theta 0, and a light sensing portion 23 as shown in drawing 2 (B).

[0022] The 1st optical transceiver machine 15 consists of CPU31, memory 32, the communications control section 33, a stage 34, a stage mechanical component 35, a driver circuit 36, and an internal bus 37, as shown in drawing 3 .

[0023] CPU31 controls the search actuation (optical-axis doubling actuation of the optical transceiver machines 15 and 16) and communication link actuation which are later mentioned according to the program stored in memory 32. Memory 32 stores the program of CPU31 of operation etc. The communications control section 33 controls the data communication between a cable 11 and this optical transceiver machine 15. The light-emitting part 21 for a communication link, the light-emitting part 22 for a search, and the light sensing portion 23 are being fixed to the stage 34. The stage mechanical component 35 adjusts the sense of a stage 34 to the bottom of control of CPU31, and scans each optical axis (it is only hereafter called an optical axis) of the light-emitting part 21 for a communication link, the light-emitting part 22 for a search, and a light sensing portion 23 to the X-axis and Y shaft orientations. To the bottom of control of CPU31, a driver circuit 36 drives the light-emitting part 21 for a communication link (lighting), drives the light-emitting part 22 for a search, and transmits the input signal of a light sensing portion 23 through an internal bus 37 at the communications control section 33.

[0024] The 2nd optical transceiver machine 16 has the same configuration substantially with the configuration of the 1st optical transceiver machine 15 shown in drawing 3 , if the point which is not equipped with the light-emitting part for a search is removed.

[0025] Next, actuation of the optical transceiver machines 15 and 16 of such a configuration is explained. At the time of normal operation, the optical transceiver machine 15 or CPU31 of 16 drives the light-emitting part 21 for a communication link through a driver circuit 36, and transmits the signal supplied from Rhine 11 and 12 through the communications control section 33 to the optical transceiver machines 16 and 15 which counter. Moreover, the lightwave signal transmitted from the optical transceiver machines 16 and 15 which counter is received by the light sensing portion 23, and this is transmitted to Rhine 11 and 12 through the communications control section 33.

[0026] Next, actuation and the procedure of optical-axis doubling of the optical transceiver machines 15 and 16 are explained with reference to the flow chart of drawing 4 . In addition, in the following explanation, the 1st optical transceiver machine 15 is used as a main phone, the 2nd optical transceiver machine 16 is used as a cordless handset, and the actuation which sets an optical axis in the direction in search of the direction of the whereabouts of a communications partner is called a search.

[0027] First, initiation of optical-axis adjustment processing is directed with the Out switch which is not illustrated to CPU31 of a main phone 15. Answering these directions, CPU31 of a main phone 15 makes the light-emitting part 22 for a search turn on through a driver circuit 36, and makes the search GAITO light SG turn on (step S1). Since the angle of beam spread theta 1 of the search guide light SG is large, if the sense of a main phone 15 and a cordless handset 16 is adjusted to some extent, as shown in drawing 5 , a cordless handset 16 will serve as ability ready for receiving in the search guide light SG.

[0028] Initiation of optical-axis adjustment processing is directed with the Out switch which is not illustrated to CPU31 of a cordless handset 16, either. Answering these directions, CPU31 of a cordless handset 16 starts search actuation. That is, a stage 34 is made to scan by the stage mechanical component 35, and the optical axis of a cordless handset 16 is controlled so that the light-receiving quantity of light of a light sensing portion 23 serves as max (step S2). As shown in drawing 5 in this condition, the optical axis of a cordless handset 16 is mostly in agreement in the direction of a main phone 15.

[0029] Next, the light-emitting part 22 for a search of a main phone 15 is made to turn off, the light-emitting part 21 for a communication link of a cordless handset 16 is turned on, and the light (it is

hereafter called idle light) I by which intensity modulation (IM) was carried out on the specific frequency is made to transmit (step S3). CPU31 of a main phone 15 performs search actuation, it controls the angle of inclination of a stage 34 through the stage mechanical component 35 so that the light-receiving quantity of light of a light sensing portion 23 serves as max, and it adjusts it so that the optical axis of a main phone 15 may turn to the direction of a cordless handset 16 (step S4).
[0030] As the above processing shows to drawing 6 , the optical axis of a main phone 15 and the optical axis of a cordless handset 16 will be in the condition of having been mostly in agreement. Next, the light-emitting part 21 for a communication link of a main phone 15 is turned on, and the idle light I is made to transmit (step S5). CPU31 of a cordless handset 16 controls the angle of inclination of a stage 34 through the stage mechanical component 35 so that the light-receiving quantity of light of a light sensing portion 23 serves as max, and it adjusts it so that the optical axis of a cordless handset 16 may turn to the direction of a main phone 15 (step S6).
[0031] Henceforth, when the same actuation is repeated the number of predetermined times, optical-axis adjustment processing is ended.
[0032] Since the light-emitting part 22 for a search of a main phone 15 transmits the large search guide light SG of an angle of beam spread according to the communication system of the gestalt of this operation as explained above, at the time of optical-axis adjustment, the processing which makes the optical axis of a main phone 15 and a cordless handset 16 in agreement to some extent can be simplified, and optical-axis adjustment processing can be performed easily.
[0033] Although only the light-emitting part 22 for a search of a main phone 15 was made to turn on by the 1st search, both the light-emitting part 22 for a search and the light-emitting part 21 for a communication link may be made to turn on in the above explanation. In this case, the search guide light SG can adjust the optical axis of a cordless handset 15 roughly, then the optical axis of a cordless handset 16 can be set by the main phone 15 comparatively correctly using the idle light I.
[0034] (Gestalt of the 2nd operation) When the optical axis of a main phone 15 and a cordless handset 16 is in the condition of an inequality, or when the congruous opticals axis change into the condition of an inequality, the idle light I from the carrier light-emitting part 21 for a communication link of a cordless handset 16 does not reach the light-emitting part 23 of a main phone 15, and a main phone 15 cannot detect the idle light I from a cordless handset 16. For this reason, the communication link between a main phone 15 and a cordless handset 16 is impossible, and the activity which adjusts an optical axis is needed. Then, when the light sensing portion 23 of a main phone 15 cannot receive the idle light I from a cordless handset, the light-emitting part 22 for a search may be made to emit light compulsorily.
[0035] In this case, CPU31 of a main phone 15 makes the light-emitting part 22 for a search emit light through a driver circuit 36, when the monitor of the output signal of a light sensing portion 23 is carried out through a driver circuit 36 and the received signal level of a light sensing portion 23 falls from a predetermined threshold.
[0036] Thus, when the optical axis is not in agreement, optical-axis adjustment processing can be soon started by the cordless handset 16 side by emitting the search GAITO light SG compulsorily. Moreover, when the optical axis is in agreement and it is communicating between the main phone 15 and the cordless handset 16, the search GAITO light SG is not emitted and it does not become communicative hindrance, either.
[0037] (Gestalt of the 3rd operation) In the gestalt of the 1st operation, although the light-emitting part 21 for a communication link and the light-emitting part 22 for a search of a main phone 15 have been arranged according to an individual, the light-emitting part 21 for a communication link and the light-emitting part 22 for a search may be shared.
[0038] Drawing 7 shows the example of a configuration of a common light-emitting part, and consists of the optical system 42 and the control sections 43 which consist of a light emitting device 41, a lens, etc. At the time of the optical communication of a main phone 15 and a cordless handset 16, a control section 43 controls optical system 42, and an angle of beam spread generates the idle light I of theta 0. On the other hand, at the time of optical-axis adjustment (at or the time of un-communicating), through a

driver 36, CPU31 controls optical system 42, makes an angle of beam spread theta 1 large (formation of extensive orientation), and generates the search GAITO light SG.
[0039] (Gestalt of the 4th operation) In the gestalt of the 1st operation, although the optical axis of a cordless handset 16 suits the main phone 15 after the 1st search of a cordless handset 16 is completed, the optical axis of a main phone 15 does not suit a cordless handset 15 yet. For this reason, there is a possibility that the receive section 23 of a main phone 15 cannot receive idle light from a cordless handset 16. In order to solve this problem, as shown in drawing 8 , the large light sensing portion 24 of the angle of beam spread only for searches may be arranged independently [a light-emitting part 23] to a main phone 15. After the 1st search actuation of a cordless handset 16 is completed by arranging the light sensing portion 24 for a search, as shown in drawing 9 , the idle light I from a cordless handset 16 is receivable with the light sensing portion 24 for a search of a main phone 15. That is, the idle light I from a cordless handset 16 is receivable only by performing search actuation of a cordless handset 16 once with the main phone 15 whose optical axis does not correspond with a cordless handset 16 yet. Therefore, the actuation which sets the optical axis of a main phone 15 by the cordless handset 16 can be automatically started using this input signal.
[0040] (Gestalt of the 5th operation) In the gestalt of the 1st - the 3rd operation, although each search actuation with a main phone 15 and a cordless handset 16 needed to be started according to the individual, it is possible to also make a series of search actuation continue automatically. Hereafter, multiple-times continuation of the search actuation of a main phone 15 and a cordless handset 16 is carried out, and if an optical axis is in agreement in a certain amount of precision, the system which terminates a search will be explained.
[0041] In this example, the 1st predetermined pulse pattern by turning on and off of the idle light I shown in a main phone 16 (or cordless handset 15) from a cordless handset 15 (or main phone 16) at drawing 10 is sent out, and termination of search actuation is notified to the other party. Moreover, if multiple times are searched and an optical axis is in agreement in a certain amount of precision, the 2nd pulse pattern shown in drawing 11 will be transmitted, and termination of optical-axis adjustment processing will be notified to the other party. That on-off period of this 2nd pulse pattern is short enough, and is easily more nearly identifiable than the "on" period of the 1st pulse pattern.
[0042] An series of optical-axis adjustment actuation in this case is explained with reference to drawing 12 . First, initiation of optical-axis adjustment processing is directed to a main phone 15 and a cordless handset 16 from the exterior. Answering these directions, CPU31 of a main phone 15 controls a driver 36, and makes the search guide light SG transmit (step T1). On the other hand, CPU31 of a cordless handset 16 controls the optical axis so that receiving luminous intensity becomes the strongest (step T2). After CPU31 of a cordless handset 16 ends search actuation, a driver circuit 36 is driven and the idle light I containing the 1st pulse pattern shown in drawing 10 is made to transmit to the light-emitting part 21 for a communication link (step T3).
[0043] CPU31 of a main phone 15 compares the receiving level of a light sensing portion 23 with a predetermined threshold, after emitting light in the search guide light SG, and it stands by reception of the 1st pulse pattern shown in drawing 10 (step T four). If it distinguishes having received the 1st pulse pattern by step T four, CPU31 of a main phone 15 will start search actuation using the idle light I from a cordless handset 16, after switching off search guide light (step T5).
[0044] Henceforth, the same actuation is repeated and the doubling precision of an optical axis is improved. When multiple-times activation of the search actuation is carried out and the optical axis of a main phone 15 and a cordless handset 16 is in agreement in predetermined precision, CPU31 of a main phone 15 makes the 2nd pulse pattern which is the termination signal of optical-axis doubling transmit to the light-emitting part 21 for a communication link through a driver circuit 36 (if for count activation of predetermined of the search actuation to be carried out) (step T6).
[0045] Then, it moves from CPU31 of a main phone 15 to actuation of the usual optical-communication processing (step T7). Moreover, into the output signal of a light sensing portion 23, CPU31 of a cordless handset 18 detects the 2nd pulse pattern, distinguishes that an series of optical-axis adjustment processings were completed (step T8), and moves from it at actuation of the usual optical-

communication processing (step T9).
[0046] By such actuation, only by performing the directions at the time of initiation of optical-axis doubling processing, a series of subsequent optical-axis doubling processings can be performed automatically, and can be automatically terminated on certain conditions.
[0047] (Gestalt of the 6th operation) If the 1st search actuation of a main phone 15 is manually signed even if the main phone 15 is not equipped with the large light sensing portion of the angle of beam spread only for searches, each search actuation of the future main phones 15 and a cordless handset 16 can be started automatically.
[0048] When the light-emitting part 22 for a search and the carrier light-emitting parts 21 and 23 for a communication link which are shown in drawing 2 cannot arrange on a concentric circle in the gestalt of the 5th operation, (Gestalt of the 7th operation) When the optical axis of a main phone 15 points to the cordless handset 16 and the optical axis of a cordless handset 16 has shifted from the main phone 15, a cordless handset 16 performs the 1st search, transmits the 1st pulse pattern to a main phone 15 after that, and goes into the condition of waiting for termination of a search of a main phone 15. However, since the optical axis of a main phone 15 suits the cordless handset 16, the level of the receiving light of a cordless handset 16 exceeds a threshold, and a cordless handset 16 starts the 2nd search. After the search of the count of predetermined is completed, a cordless handset 16 transmits the 2nd pulse pattern to a main phone 15, and shifts to the usual communication link condition.
[0049] However, since a cordless handset 16 will be searched twice toward the light-emitting part for a search of a main phone 15, the communication link light of a cordless handset 16 cannot communicate in the light sensing portion 23 for a communication link of a main phone 15. Then, since the search termination signal of a cordless handset 16 is unreceivable after search actuation termination with manual operation etc. even if it makes search actuation perform to a main phone 15 (finishing [sending out] already), it will not be in the condition which can be communicated too. That is, the sequence omission that only a cordless handset performs a search continuously arises, without waiting for the search of a main phone.
[0050] In order to solve this problem, whenever it performs intensity modulation of the idle light I on the frequency in which a main phone 15 differs from a cordless handset 16 and one search is completed, the method of replacing transmit frequencies and received frequency is effective. Since according to such a configuration the transmit frequencies of a cordless handset 16 change and it differs from the received frequency of a main phone 15, for example when the 1st search of a cordless handset 16 is completed, the situation which starts the 2nd search can be prevented. And it returns to an original modulation and an original recovery frequency with the 2nd pulse pattern signal which shows search termination.
[0051] Actuation of the communication system of such a configuration is explained with reference to drawing 13 . A main phone 15 shall make once, a cordless handset 16 shall make the count of a search 2 times, and this example shall not equip a main phone 15 with the light sensing portion 24 for a search, but the 1st search of a main phone shall be started manually. Moreover, f1 and f2 show the idle light I and search guide luminous-intensity modulation frequency.
[0052] First, suppose that only the optical axis of a cordless handset 16 shifted according to a certain cause in the condition of the optical axis of a main phone 15 and a cordless handset 16 having been in agreement, having transmitted the idle light and search guide light to which intensity modulation of the main phone 15 was carried out on the frequency f2, and having transmitted the idle light to which intensity modulation of the cordless handset 16 was carried out on the frequency f1.
[0053] In this case, since the optical axis of a cordless handset 16 has not turned to a main phone 15, a main phone 15 cannot receive idle light from a cordless handset 16, but emits light in the search guide light SG (step P1). This search guide light SG is also made into the lightwave signal by which intensity modulation was carried out on the frequency f2. A cordless handset 16 answers manual operation etc. and performs the 1st search (step C1). If a search is completed, a cordless handset 16 will set modulation frequency of the idle light which transmits to f2, and will set modulation frequency of receiving light to f1. Then, it goes into the condition of waiting for termination of a search of a main phone 15 (step C2).

[0054] On the other hand, in a main phone 15 side, a main phone 15 starts search actuation, an operator distinguishing that search actuation of a cordless handset 16 was completed visually, and using modulation frequency of f1 and receiving light as f2 for the modulation frequency of the idle light which answers and transmits to manual operation etc. (step P2). After ending search actuation, a main phone 15 transmits the 1st pattern pulse to a cordless handset 16, and will be in the condition of waiting for termination of search actuation of a cordless handset.
[0055] Since the 1st pulse pattern from a main phone 15 is modulation frequency f1, it is received by the cordless handset 16 and a cordless handset 16 starts the 2nd search actuation (step C3).
[0056] The 2nd search termination of a cordless handset 16 transmits the 2nd pulse pattern signal which shows search termination to a main phone 15 (step C4). Furthermore, the transmit frequencies (modulation frequency of amplitude modulation) of idle light are changed to f1, the received frequency (modulation frequency of amplitude modulation) of idle light is changed to f2 (step C4), and reception of the communication link lightwave signal from a main phone 15 is stood by (step C5).
[0057] The 2nd pulse pattern is answered from a cordless handset 16, the transmit frequencies of idle light are changed into f2, it changes received frequency into f1, and a main phone 15 stands by reception of the communication link lightwave signal from a cordless handset 16 (step P4).
[0058] According to such a configuration, since the received frequency and transmit frequencies of idle light are changed for every search actuation, a sequence omission is prevented and suitable optical-axis adjustment is attained.
[0059] In addition, this invention is not limited to the gestalt of the above-mentioned implementation, but various deformation and application are possible for it. For example, the appearance configuration of the optical-communication LAN system shown in drawing 1 and the optical transceiver machine shown in drawing 2 , the circuitry of the optical transceiver machine shown in drawing 3 , etc. are instantiation, and if they can realize the same function substantially, they can be changed into arbitration. Moreover, in the gestalt of the 7th operation, although modulation frequency was changed for every search actuation, the frequency of light itself may be changed.
[0060]
[Effect of the Invention] According to this invention, using a large light for optical-axis adjustment, an angle of beam spread performs optical-axis adjustment of optical transceiver machines easily, and can automate.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the example of a configuration of the optical transmission system concerning the gestalt of implementation of the 1st of this invention.
[Drawing 2] (A) and (B) are drawings showing the appearance configuration of the 1st and 2nd optical transceiver machine shown in drawing 1 , respectively.
[Drawing 3] It is the block diagram showing the circuitry of the 1st optical transceiver machine shown in drawing 1 .
[Drawing 4] It is the flow chart which shows the procedure of the optical-axis adjustment processing concerning the gestalt of the 1st operation.
[Drawing 5] It is drawing for explaining search actuation of a cordless handset.
[Drawing 6] It is drawing for explaining search actuation of a main phone.
[Drawing 7] It is the explanatory view showing the structure of the light-emitting part of the gestalt of the 3rd operation, and the angle of beam spread of transmitting light.
[Drawing 8] It is drawing showing the appearance configuration of the optical transceiver machine concerning the gestalt of the 4th operation.
[Drawing 9] It is the explanatory view showing the search condition of the optical transceiver machine concerning the gestalt of the 4th operation.
[Drawing 10] It is drawing showing the 1st pulse pattern signal which shows termination of each search actuation.
[Drawing 11] It is drawing showing the 2nd pulse pattern signal which shows termination of a series of search actuation.
[Drawing 12] It is the sequence diagram showing the procedure of the search actuation in the gestalt of the 5th operation.
[Drawing 13] It is the sequence diagram showing the procedure of the search actuation in the gestalt of the 7th operation.
[Drawing 14] It is the explanatory view showing the condition of the conventional optical transceiver machines which can be communicated.
[Drawing 15] It is the explanatory view showing the communication link impossible condition of the conventional optical transceiver machines.
[Description of Notations]
15 Optical Transceiver Machine (Main Phone)
16 Optical Transceiver Machine (Cordless Handset)
21 Light-emitting Part for Communication Link
22 Light-emitting Part for Search
23 Light Sensing Portion
24 Light Sensing Portion for Search
41 Light Emitting Device
42 Optical System

I Idle light
SG Search guide light

[Translation done.]

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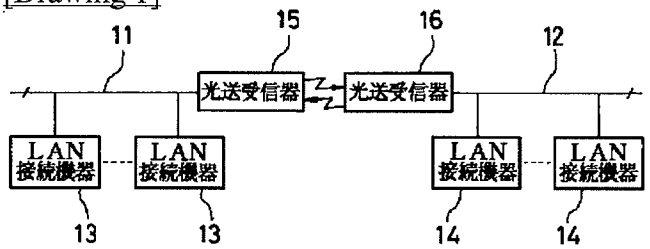
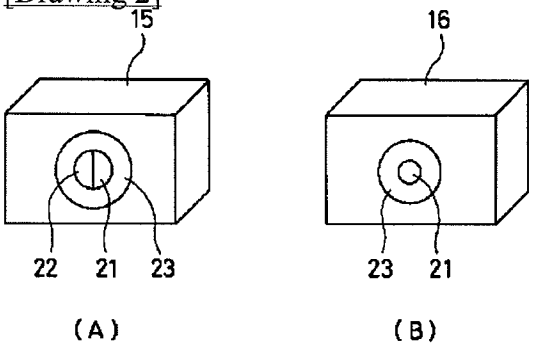
DRAWINGS

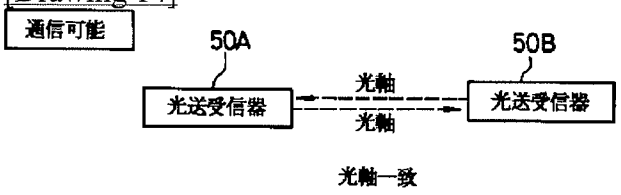
[Drawing 1]



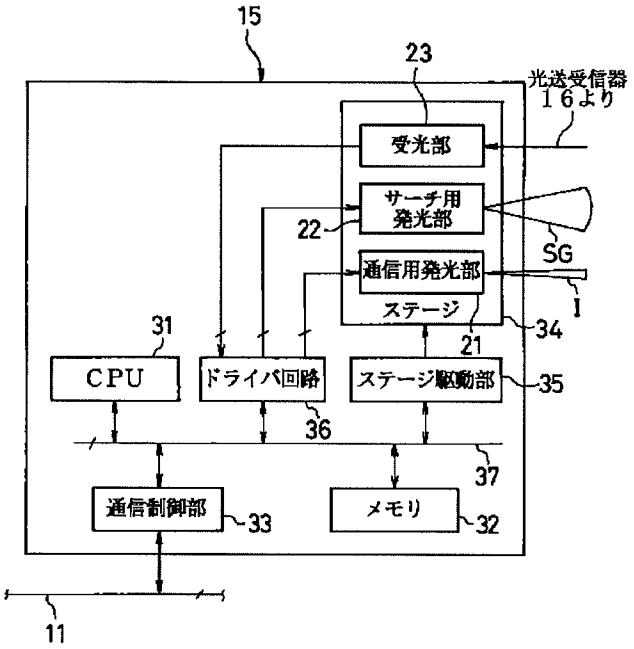
[Drawing 2]



[Drawing 14]



[Drawing 3]



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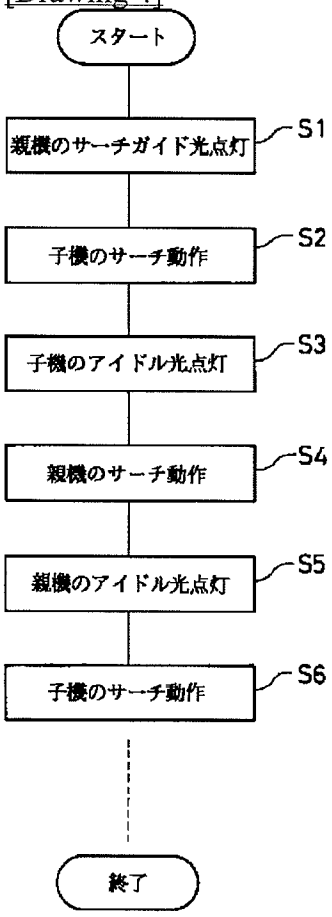
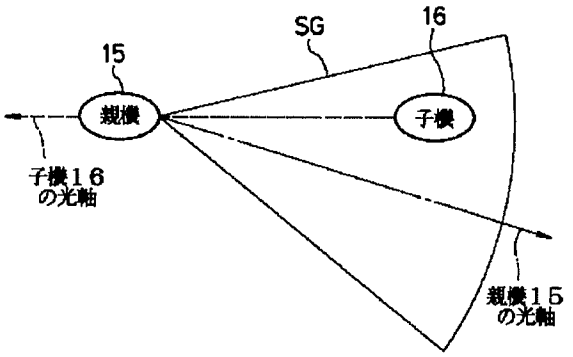


[Drawing 5]



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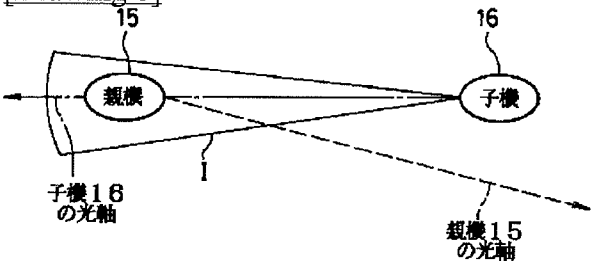
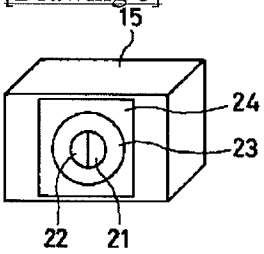


[Drawing 8]



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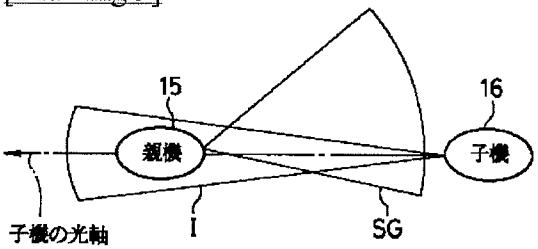
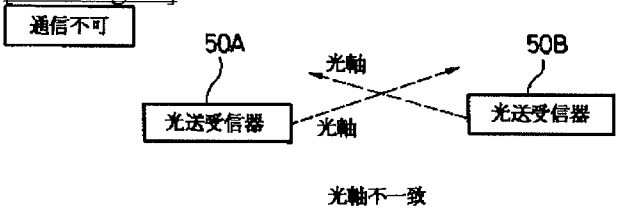
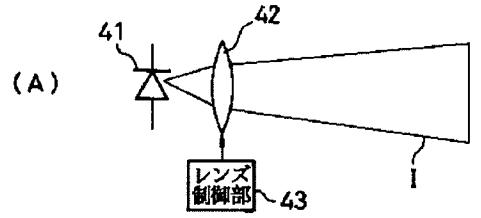
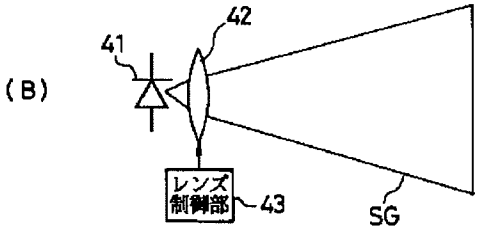


[Drawing 15]

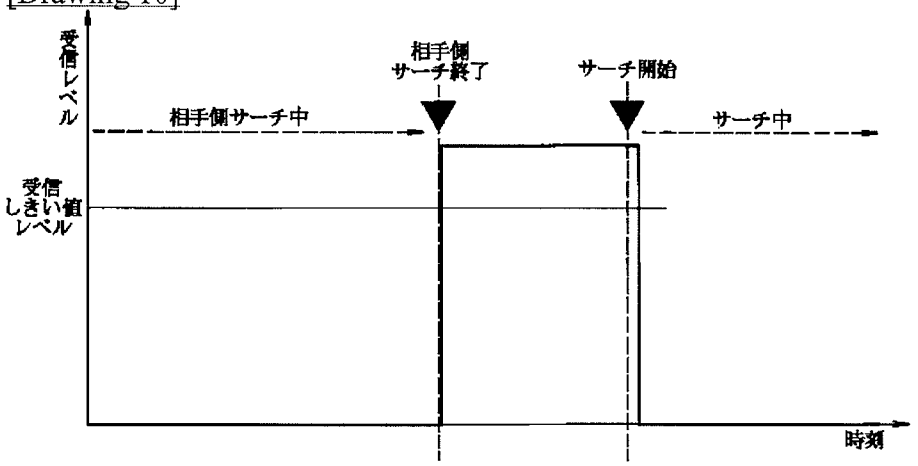


[Drawing 7]

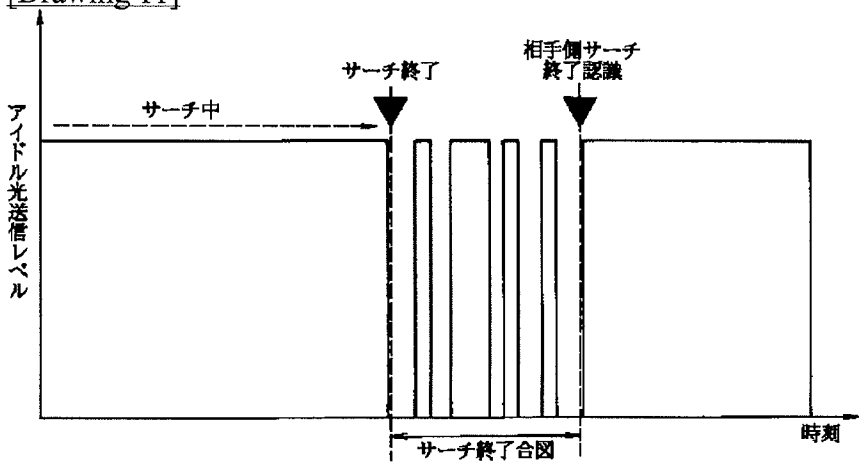




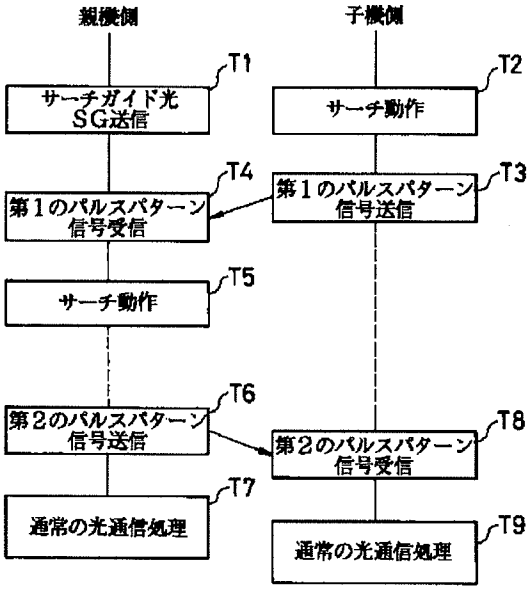
[Drawing 10]



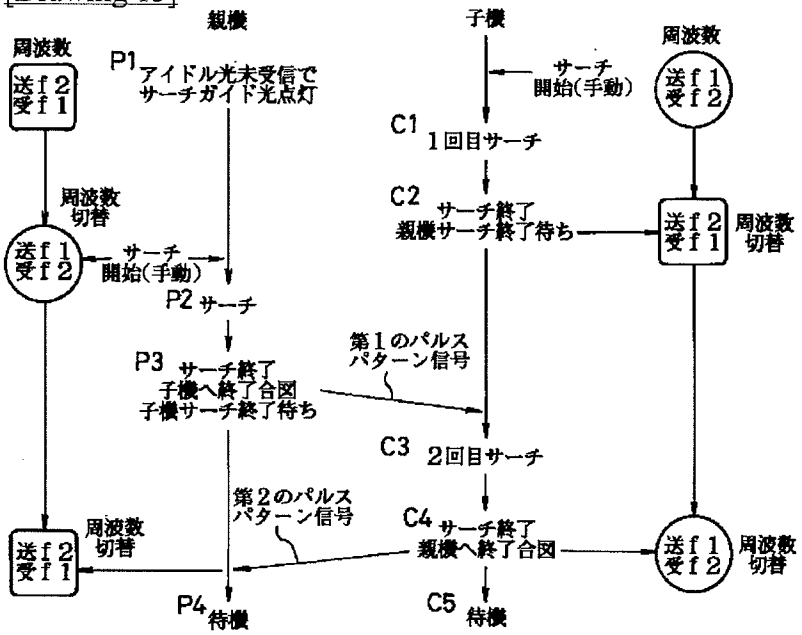
[Drawing 11]



[Drawing 12]



[Drawing 13]



[Translation done.]